REMARKS

Reconsideration of the rejection of claims 7-11 under 35 USC §101 for lacking utility is respectfully requested. The specification is clear that at least one feature of the invention lies in the generation of representations or models (i.e., renditions) of elementary particle states. It cannot be questioned that models have many purposes, including that of instruction and analysis. Furthermore, it has been acknowledged that budgets for research regarding elementary particle physics have been seriously reduced. See, for example the attached article from SCIENCE, Vol. 310, page 1882. Thus, it is even more important to provide analytical tools to facilitate research that is hampered by the lack of access to physical equipment.

It is respectfully submitted that the above represents a well-established utility pursuant to M.P.E.P. §2107.

It is submitted that this application is in condition for allowance, and an early indication thereof is respectfully requested. The examiner is invited to contact the undersigned if any matter remains outstanding.

This includes a request for continued examination.

All necessary extensions of time are hereby requested. Please charge any deficiency and credit any excess to deposit account 50-1088.

Respectfully submitted,
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Breakdown of the Year: U.S. Particle Physics

Particle physicists in the United States would probably like to forget 2005. Budget woes forced the cancellation of two major experiments just as researchers were about to start construction. That leaves none in the works to replace those currently studying particles called quarks—the sorts of experiments that have long been the heart of the field. At the same time, the U.S. Department of Energy (DOE) asked physicists to consider which of two existing particle colliders they would rather shut down early to save money.

Researchers around the globe fear that if U.S. particle physics withers, so will the entire field. "We all need a vitally active U.S. community," says Brian Foster of Oxford University in the U.K. "That's what's driven particle physics in the past, and hopefully that's what will drive it in the future."

Physicists got a shock in February, when DOE nixed BTeV, a $140 million experiment that would have run at the Fermi National Accelerator Laboratory (Fermilab) in Batavia, Illinois (*Science*, 11 February, p. 832). Using beams from Fermilab's Tevatron collider, BTeV would have studied bottom quarks, heavier, unstable cousins of the down quarks found in protons and neutrons. BTeV researchers were expecting to get the final go-ahead for construction.

Early end? Either SLAC's PEP-II collider (*above*) or Fermilab's Tevatron could shut down ahead of schedule.

Less surprisingly, in August the National Science Foundation pulled the plug on the Rare Symmetry Violating Processes (RSVP) experiment at DOE's Brookhaven National Laboratory in Upton, New York (*Science*, 19 August, p. 1163). RSVP would have looked for new physics in the decays of particles called muons and K^0 mesons. But its construction costs had ballooned from $145 million to $282 million, and its lifetime operating costs had tripled to $250 million.

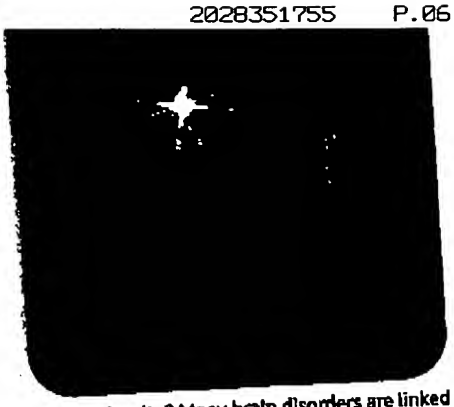
In May, DOE's Office of Science requested a study, due early next year, of the relative merits of shutting down either the Tevatron or the PEP-II collider at the Stanford Linear Accelerator Center in Menlo Park, California (*Science*, 27 May, p. 1241). The Tevatron smashes protons into antiprotons at the highest energies achieved to make top quarks and other particles; PEP-II collides electrons and positrons and cranks out bottom quarks. Researchers plan to turn off PEP-II in 2008 and the Tevatron in 2009, but decommissioning one of them earlier might free up money for future projects.

Meanwhile, researchers in Europe are assembling the Large Hadron Collider at CERN, the particle physics laboratory near Geneva, Switzerland. Scheduled to start up in 2007, the $7.7 billion machine might produce the long-sought Higgs boson, the particle thought to give others their mass. At the same time, physicists in Japan have their KEK-B collider producing bottom quarks and are studying wispy particles called neutrinos. (Fermilab is also pursuing neutrino physics.)

But particle physicists from Europe and Asia aren't celebrating the passing of the torch from the United States. They say a strong U.S. program is essential for the survival of the field, especially if they hope to build the proposed International Linear Collider (ILC), a multibillion-dollar global facility that most see as the future of particle physics. "It is very clear that without the participation of the U.S. it is impossible" to build the ILC, says Akira Masaike of the Japan Society for the Promotion of Science in Washington, D.C.

On that front, at least, 2005 brought some reasons for optimism, says Fred Gilman of Carnegie Mellon University in Pittsburgh, Pennsylvania. Physicists from the United States, Europe, and Asia united in their commitment to the ILC as never before. "Before, the international effort was the sum of three parts," Gilman says. "Now there is central leadership." And officials in DOE's Office of Science remain enthusiastic about the ILC, Gilman says. Physicists plan to have a preliminary design—and a price tag—for that dream machine by the end of 2006.

—ADRIAN CHO



Flawed circuits? Many brain disorders are linked to genes affecting development.

formation by neurons and is active during development in brain regions thought to be altered in Tourette syndrome and other conditions, including obsessive compulsive disorder. New research also links developmental genes to dyslexia, identifying three genes—*KIAA0319*, *DCDC2*, and *ROBO1*—that may cause faulty wiring in neural circuits involved in reading.

Much of the new work suggests that genetic miscues, rather than causing neuropsychiatric disorders outright, alter brain biology in the womb in a way that predisposes us to problems later in life. A better understanding of how this happens may help reduce the risks.

6 Geochemical Turmoil

When researchers announced in June that they had detected isotopic differences between earthly and extraterrestrial rocks, geochemists had to scrap their long-standing view of how Earth formed and evolved. They no longer believe that thoroughly mixed dust and ice agglomerated 4.5 billion years ago to form an Earth that has remained more or less mixed ever since. Something more interesting must have happened.

Key to the cosmochemical revolution was new technology. In the early 1980s, researchers

Complicated. Young Earth had a more interesting history than scientists believed.